Fifth consecutive ‘failed’ rainy season in East Africa predicted

Description

Meteorological and climate projection expertise at the Met Office is not just confined to the UK, we have a number of experts working in regions around the world. A key region where this expertise is vital is Eastern Africa, where the population is particularly vulnerable to environmental fluctuations. In this blog, Met Office Scientific Manager (Seasonal to Climate Applications) Tammy Janes explains what the Met Office does in the region and why it is so important with the prospect of a fifth consecutive ‘failed’ rainy season.

What the Met Office does in East Africa

Met Office scientists like myself have been working alongside colleagues in the Greater Horn of Africa (GHA) for over a decade to better understand and predict key rainy seasons for the region, helping to develop the skill of local seasonal forecasters and decision-makers to deliver actionable seasonal advice for the protection of lives and livelihoods.

We work in collaboration with the IGAD Climate Prediction and Applications Centre (ICPAC) which is the designated Regional Climate Centre for the World Meteorological Organization (WMO). Along with counterparts from 11 National Meteorological Services, ICPAC lead the production of seasonal forecasts based on an analysis of several global climate model predictions customised for the Greater Horn of Africa.

A key focus point of our work here is a triannual summit called the Greater Horn of Africa Climate Outlook Forum (GHACOF) which brings together a range of seasonal climate specialists as well as stakeholders from across sectors including agriculture, energy, water and many more.

Our support to the GHACOF process has involved delivering training programmes, engaging with sector-users, and promoting the use of robust and verifiable scientific methods in the forecasting process. The latest GHACOF meeting took place in Mombasa just last week (23-26 August 2022) and I was there in person with my colleague Scott for the first time since January 2020. We attended alongside colleagues from the Met Office-managed Weather and Climate Information Services (WISER) programme, which has supported over 3.3 million households to better access weather and climate information services in the region for the past seven years, helping to improve resilience to weather and climate related shocks.

GHACOF-62 was a fantastic opportunity to strengthen existing relationships and build new ones. We were involved in some of the side events at the conference and Scott delivered a key talk on the current and predicted state of climate drivers that are well known to impact the upcoming ‘short rains’ during October to December.

Met Office Scientist Scott Burgan presenting at GHACOF-62

What the latest outlooks are saying

The latest outlook released by ICPAC is showing a high likelihood of below normal rainfall for East Africa during the upcoming October to December short rains, particularly in the drought affected regions of Ethiopia, Kenya, and Somalia. This is largely being driven by the combined effect of a predicted continuation of current La Niña conditions and a negative Indian Ocean Dipole (IOD). The ICPAC outlook is consistent with the Met Office seasonal outlook for Africa which has also just been updated.

This outlook is so important because parts of the region, including coastal Kenya, central/southern Somalia and central Ethiopia, have experienced four consecutive ‘failed’ rainy seasons since 2020, and a fifth ‘failed’ October-December rainy season would drive further deterioration of an already stressed humanitarian system.

Unprecedented situation

The October to December season in the equatorial parts of the Greater Horn of Africa contributes up to 70% of the annual total rainfall, particularly in eastern Kenya. The consecutive below average, or ‘failed’ rains are causing an unprecedented situation in what has been the longest drought in 40 years, suggesting that extreme weather and climate events are getting more extreme

The fear is that the strategies that have been put in place previously to cope with these sorts of events may not be enough to protect the lives and livelihoods of vulnerable communities in the Greater Horn of Africa with year-on-year deterioration.

Dire consequences

The impacts of prolonged lower than average rainfall are varied and significant. The predicted below-average October-December season would drive a deterioration of an already dire food security and malnutrition situation in 2023. Over 50 million people are expected to face high levels of food insecurity.

Irrespective of rainfall between October and December, conditions will not recover quickly enough to see food security improvements before mid-2023. A rapid scaling up of action is needed now to save lives and avert starvation and death. Dr.Guleid Artan, Director of ICPAC, said, “In Ethiopia, Kenya, and Somalia, we are on the brink of an unprecedented humanitarian catastrophe”.

A recent statement from the Food and Agriculture Organization (FAO) of the UN highlighted that “current appeals to respond to the drought remain well underfunded” and that the “drought response needs to be increased immediately to prevent the already severe food emergency, including a risk of famine in Somalia, from deteriorating into an even more dire situation.”

Ongoing support

Alongside other science colleagues at the Met Office, we will continue working with our African partners to provide important support to help decision makers and humanitarian organisations act on what is ahead.

At COP26 in Glasgow last November, the UK Government’s Foreign, Commonwealth and Development Office (FCDO) announced additional funding for the WISER programme in Africa.

WISER has worked in East Africa and the Sahel to deliver transformational change in the access and use of weather and climate information services to people and organisations including National Meteorological and Hydrological Services (NMHSs). It delivered over £200million in socio-economic benefits during that time, including enabling improved protection of property, livelihoods and even saving lives through its projects.

The WISER programme is now expanding into additional regions through its WISER Africa programme, including West and Southern Africa, as well as the Middle East and North Africa (MENA) through WISER MENA. It is currently in its scoping phase, with projects expected to begin in early 2023. To find out more about WISER, visit the WISER webpages on the Met Office website.

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September 2022

Met Office concludes project demonstrating uncrewed aircraft operations

Description

sees.ai grid inspection drone takes flight (Image: sees.ai)

Uncrewed drones could be a step closer following the conclusion of a project as part of Future Flight Challenge Phase 2. The Met Office supported the consortium lead, sees.ai, in the 'Distributed BVLOS Aviation System' project, aimed at developing and validating the first aviation system capable of enabling commercial 'Beyond Visual Line of Sight' (BVLOS) drone services at scale alongside manned aviation (including complex missions in congested urban and industrial environments).

Starting in December 2020 and concluding May 2022, the project was funded as a share of £30million from the Industrial Strategy Fund (ISCF), delivered by UK Research and Innovation.

The Met Office supported the consortium lead, sees.ai, by providing forecasts for ten increasingly complex and challenging flight trials aimed at expanding and proving the concept of Beyond Visual Line of Sight (BVLOS) operations for uncrewed aircraft.

Weather forecast information, comprised of a mix of complex weather models and the expertise of meteorologists and scientists, was provided by the Met Office to understand the challenges specific to drones in varied locations in relation to the weather.

Image from sees.ai

Image from sees.ai

Trial flights were supported by the Met Office, giving confidence of safe operation and efficiency of the project to ensure maximum knowledge could be gained from trial flights. Outlook forecasts also identified when weather was likely to hamper drone performance, allowing sees.ai to cancel and reschedule flights to minimise disruption and reduce costs.

Chris Tyson, International Aviation and Developments Manager at the Met Office said: “This has been a great project to work on. Weather will bring challenges to uncrewed drone operations and it’s important all stakeholders collaborate to better understand and mitigate those challenges as the industry scales up. Having the opportunity to work so closely with sees.ai – who were open and transparent in the way they shared relevant information with the Met Office regarding their operational capabilities – has helped the Met Office better understand the challenges.”

John McKenna, CEO of sees.ai said: “The Met Office has been a hugely valuable partner on this project, providing hyper-local, real time weather reports that were instrumental in trial planning and logistics, as well as giving us crucial insight into how weather can impact uncrewed drone operations. With the Met Office’s input, the trials of our software were successful and our journey towards delivering commercial BVLOS drone operations at scale in the UK and beyond continues apace.”

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‘Fusing’ the best of UK science to build resilience to high-impact weather events and climate change

Description

An urgent need to understand the increasing impacts of extreme weather and climate change and how these affect society is the focus of an expanded Met Office initiative which is developing deeper partnerships with key British universities.

The Met Office Academic Partnership (MOAP) is fusing the research excellence of the Met Office and leading UK universities through a formal collaboration to advance the science and skill of weather and climate prediction.

The partnership will embrace the challenges set out in the Met Office’s newly refreshed Research and Innovation strategy.

Dr George Pankiewicz is the Met Office Head of Science Partnership who jointly oversees the partnership. Commenting on the future of MOAP, he said: “Tackling the challenges of high-impact weather and climate can no longer be treated as a single discipline as it increasingly requires involvement from scientists in other sectors including health, technology, artificial intelligence, and the social sciences.

“So, we are developing our academic partnership to bring together the best of UK scientific research. By working with other centres of expertise we can cover topics where the Met Office doesn’t necessarily have an acknowledged expertise.

Temperature extremes are expected to increase in line with climate change, bringing potential impacts on health. Here a construction worker in Israel takes a cooling break during a heatwave event. Picture: Shutterstock

“A good topical example of how this program is expected to make great advances is in the sphere of heat health. This summer we saw temperature records being broken across the UK. But around the northern hemisphere there were also multiple heatwave events, bringing disruption and societal impacts to many communities.

“The increasing frequency and intensity of heat events is something that humanity will have to increasingly adapt to. Scientists at the Met Office and elsewhere are building the body of research about these events, but we recognise that isn’t sufficient alone to help society rise to future challenges.”

Dr Verity Payne, who is the Met Office’s UK Science Partnership Manager, also jointly oversees the partnership. She added: “We also need to work with scientists specialising in health and social sciences to understand more about the high-temperature impacts on society, including heat stress and mortality, and to find the best ways of mitigating the worst impacts.

“This will involve integrating lots of different sets of information and data into climate models, aided by the development of novel supercomputers providing more power. Scientists with specialisms in artificial intelligence and machine learning can, in turn, discover profound new ways of analysing data and improving insights.

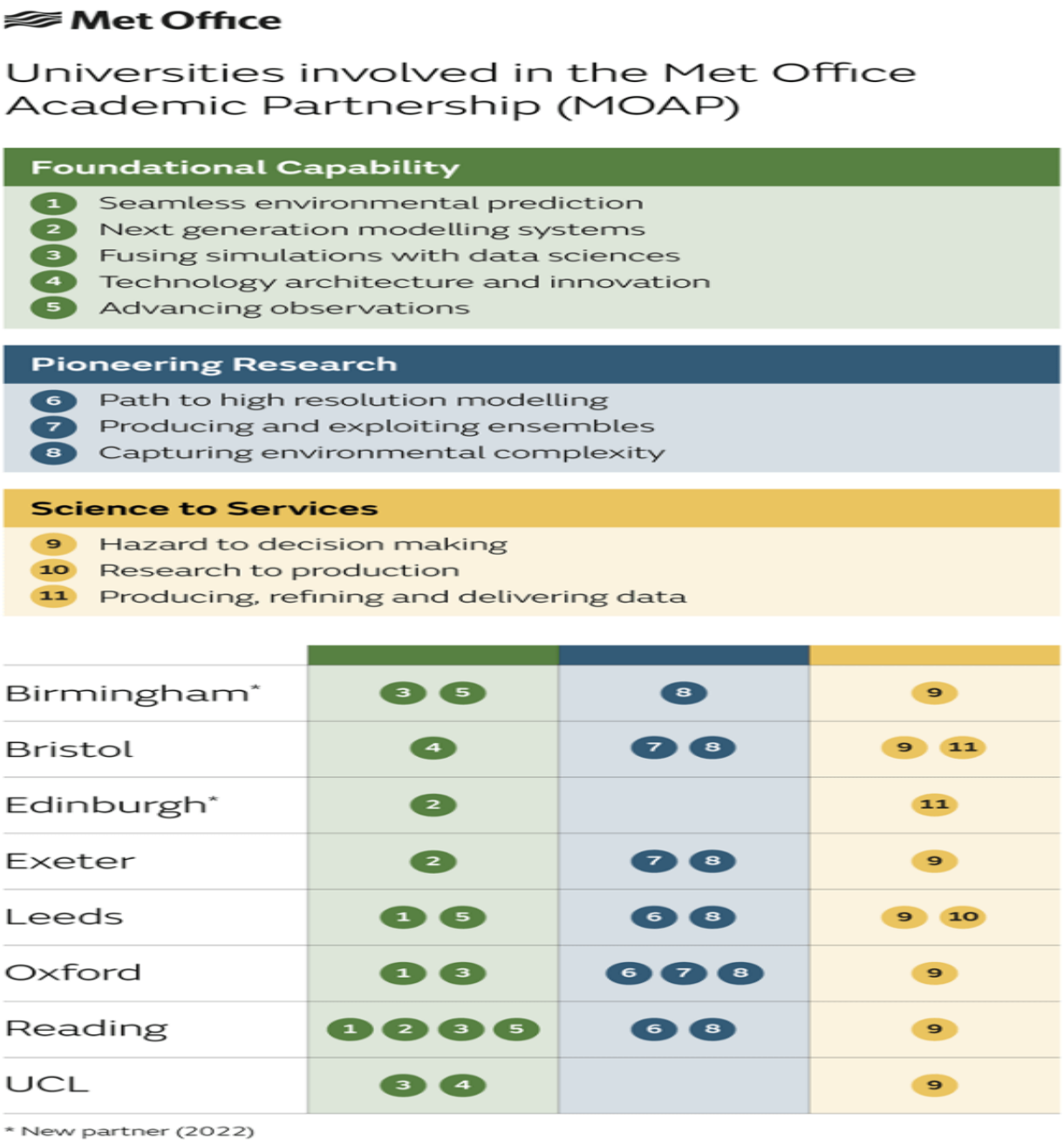
“The wider the sphere of expertise we can draw upon, the more sophisticated societal response can become.”

A key partner in the delivery of the heat health aspect is Bristol University. Professor Dann Mitchell is the joint MOAP chair at Bristol University, where his role will seek to involve all levels of the university. He said: “The impacts of higher temperatures on health are numerous and often feedback on each other in negative ways. They range from immediate impacts, such as direct temperature stress on humans, animals, and ecosystems, to longer-term factors such as decreased cognitive health from persistent exposure to decades of hotter nights.

“To calculate the full health burden of increasing heat on society it is important to carry out research blending traditional climate and weather science with different disciplines such as health science, town planning, and social responses to emergencies.

“Blending these strands together and fusing them into new research is one of the reasons why I am so excited about the momentum and real-world solutions that the academic partnership brings.”

Professor Stephen Belcher is the Met Office Chief Scientist. He concluded: “Extreme weather events and climate change pose among the greatest risks facing humanity. Tackling them is an urgent and huge undertaking. The Met Office can’t do it alone – the Met Office Academic Partnership harnesses the best of UK research and will give us the best chance of coping with and adapting to future change.”


Met Office
Universities involved in the Met Office Academic Partnership (MOAP)
Foundational Capability
1 Seamless environmental prediction
2 Next generation modelling systems
3 Fusing simulations with data sciences
4 Technology architecture and innovation
5 Advancing observations
Pioneering Research
6 Path to high resolution modelling
7 Producing and exploiting ensembles
8 Capturing environmental complexity
Science to Services
9 Hazard to decision making
10 Research to production
11 Producing, refining and delivering data
Birmingham* 3 5 8 9
Bristol 4 7 8 9 11
Edinburgh* 2 11
Exeter 2 7 8 9
Leeds 1 5 6 8 9 10
Oxford 1 3 6 7 8 9
Reading 1 2 3 5 6 8 9
UCL 3 4 9
* New partner (2022)

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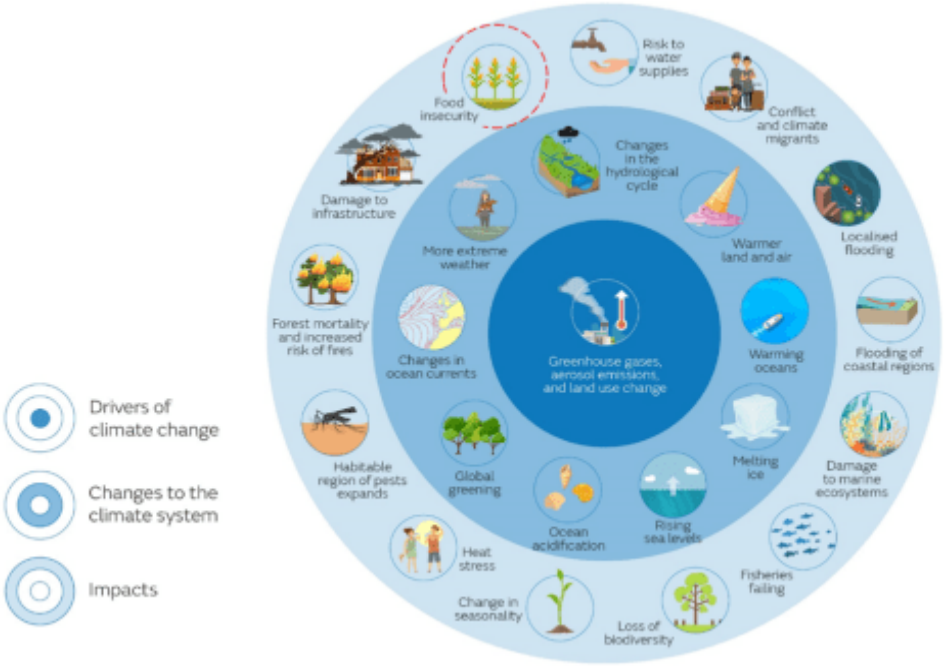
Food and farming – Delivering science to our stakeholders

Description

Met Office science is helping UK farmers prepare for a changing climate. This work includes a number of ‘Climate Services’ which are funded by Defra (Department for Environment, Food and Rural Affairs), as well as other projects.

Why do we need to adapt UK agriculture to a changing climate?

The UK Climate Projections (UKCP) show us that the UK is likely to experience ‘hotter, drier summers and warmer, wetter winters’, as well as an increase in extreme rainfall events. These changing conditions mean that we need to adapt to our changing climate, including in the agriculture sector. Adaptation is action that reduces or overcomes climate change impacts that are already happening or will happen. One example of adaptation in the agriculture sector could be building shelter for cattle so that they can be shaded during extreme heatwaves, reducing the likelihood of cattle heat stress.



The Climate Change Committee's (CCC) Independent Assessment of UK Climate Risk report (2021), which uses UKCP projections, identifies climate change as one of the greatest risks to the UK food sector. The CCC's Advice Report sets out 61 specific climate change risks and opportunities in the UK which should be considered in the next five years. It also highlights eight priority risk areas needing urgent further action over the next two years. Two out of eight of these priority risk areas relate to UK food: 'risks to crop, livestock and commercial trees from multiple climate hazards' and 'risks to supplyof food, goods and vital services due to climate-related collapse of supply chains and distribution networks.'

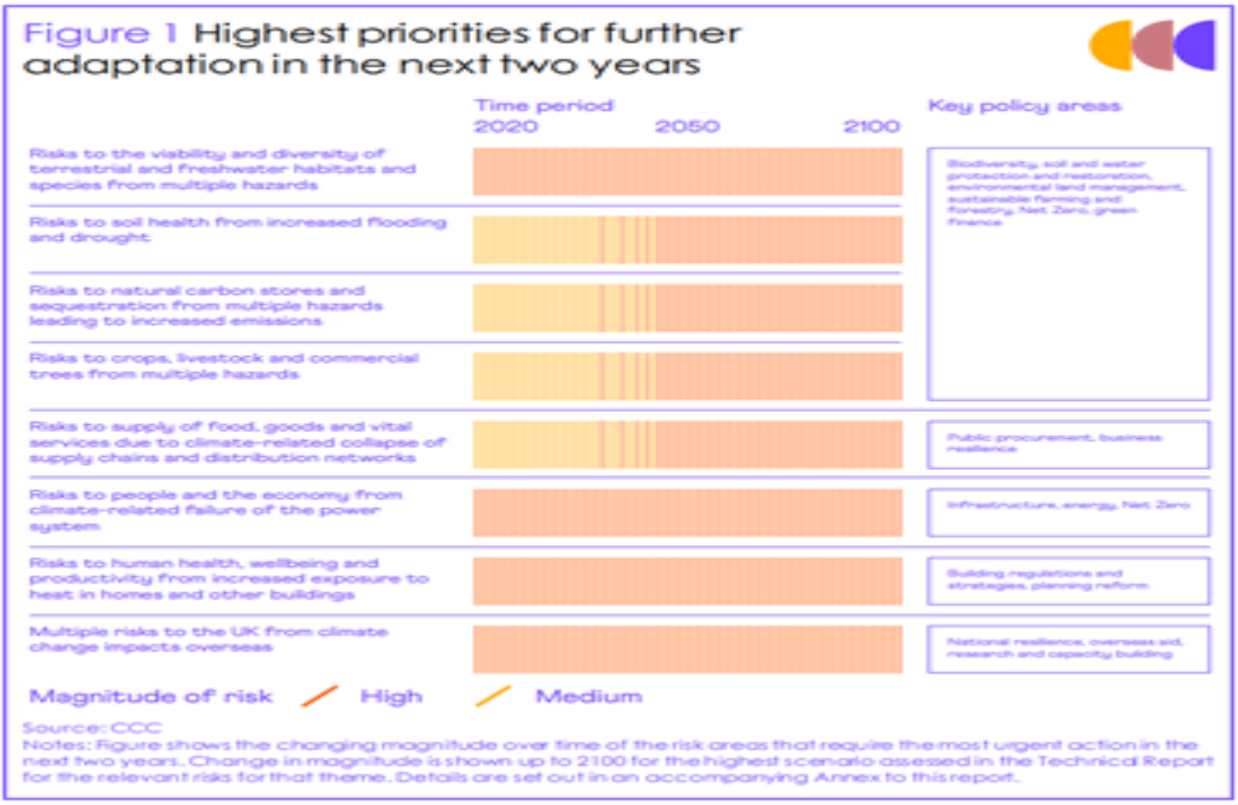


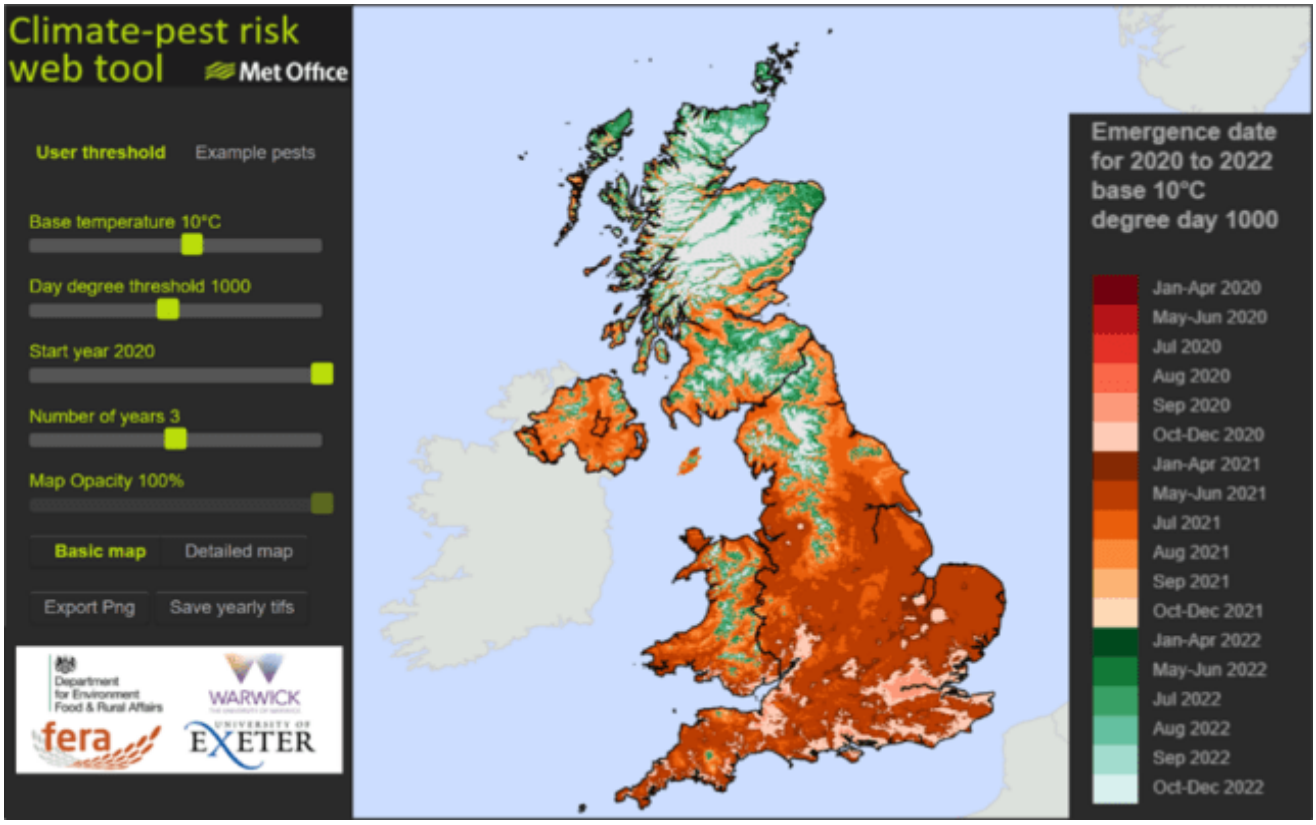
Figure 1 Highest priorities for further adaptation in the next two years
Time period
2020
2050
2100
Key policy areas
Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards
Risks to soil health from increased flooding and drought
Risks to natural carbon stores and sequestration from multiple hazards leading to increased emissions
Risks to crops, livestock and commercial trees from multiple hazards
Risks to supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks
Public procurement, business resilience
Risks to people and the economy from climate-related failure of the power system
Infrastructure, energy, Net Zero
Risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings
Building regulations and strategies, planning reform
Multiple risks to the UK from climate change impacts overseas
National resilience, overseas aid, research and capacity building
Magnitude of risk
High
Medium
Source: CCC
Notes: Figure shows the changing magnitude over time of the risk areas that require the most urgent action in the next two years. Change in magnitude is shown up to 2100 for the highest scenario assessed in the Technical Report for the relevant risks for that theme. Details are set out in an accompanying Annex to this report.

Examples of Met Office research on food and farming

The Defra-funded Met Office climate service on **Food, Farming and Natural Environment** focuses on the impacts of climate change on farming, with the aim of informing policymakers on the future adaptation needed in the farming sector. This involves close collaboration with Defra and informs policy and action through Defra's 3-yearly UK Food Security Report and contributions to the National Adaptation Plan. The climate service also has strong links to the UK's Global Food Security Programme.

Our **Plant Pest and Disease** work explores the climate sensitivities of UK plant pests and diseases. Pests, pathogens and invasive non-native species present serious risks to agricultural productivity, with consequences for livelihoods and businesses. Large-scale outbreaks or invasions may also have ramifications for food security. Climate change is increasing the risk of impacts from pests and pathogens, due to warmer and wetter conditions especially in the winter months. For example, warmer temperatures result in increased over-winter survival rates of pests.

This work also looks to enhance emergency response to pests and diseases using climate and weather data. A major output of the project has been the development of a web tool for estimating priority pest emergence. The pest web emergence tool (developed in collaboration with partners from Defra, Fera Science, University of Exeter and University of Warwick) uses gridded climate data and pest-climate relationships to provide estimates of when microclimate conditions might be suitable for known, invasive plant pests. Guidance on how to use the tool can be found here.

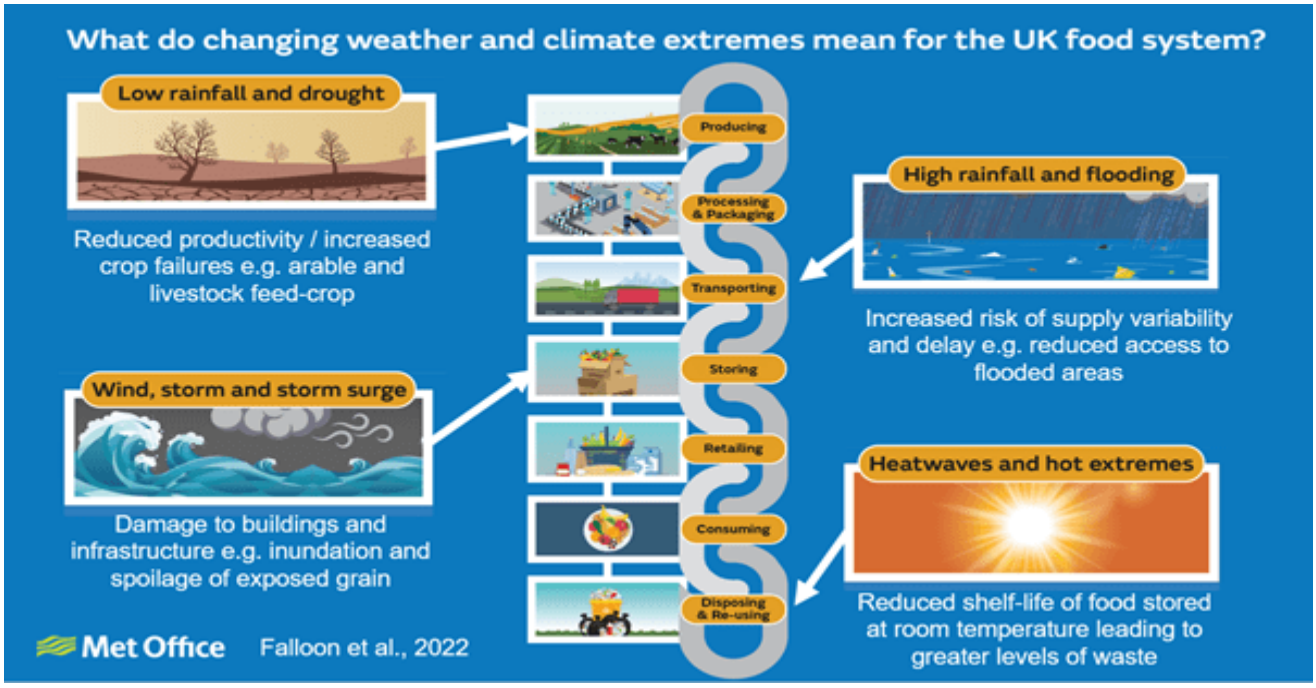


Our **Food Security** work has explored the impacts of changing weather and climate extremes across the UK food system. Weather hazards affecting the UK food system include low rainfall and drought, wind, storms and storm surges, high rainfall and flooding, and heatwaves and hot extremes. The occurrence and severity of these hazards is expected to worsen with increasing climate change. Whilst the impacts of climate change on primary production (e.g., drought leading to crop failure) are relatively well studied, there is less work looking at other parts of the food chain. For example, increased occurrence of heatwaves will impact upon workforces in the processing and packaging part of the food chain, whilst increasing storms will impact upon transport and infrastructure systems. Work done in the Met Office (Falloon et al., 2022 – What do changing weather and climate shocks and stresses mean for the UK food system? – IOPscience) is exploring climate change impacts on all these parts of the

food chain to help inform UK Government decision making.

Another example of Met Office work relating to food and farming is a UK Climate Resilience (UKCR) programme-funded project looking into future climate risks from **compound events** (Garry et al., 2021 – Future climate risk to UK agriculture from compound events | Semantic Scholar).

Compound events happen when two or more weather/climate hazards occur simultaneously or in close succession, potentially causing greater impacts than when the hazards occur alone. Future projections show UK-wide increases in the frequency and duration of thermal heat stress in dairy cattle and potato blight events. This study uses the UKCP regional projections to examine the effect of climate change on the dairy and potato farming sectors over the next thirty to fifty years (2051-2070). You can read more on this study on our website.


What do changing weather and climate extremes mean for the UK food system?
Low rainfall and drought
Reduced productivity / increased crop failures e.g. arable and livestock feed-crop
Wind, storm and storm surge
Damage to buildings and infrastructure e.g. inundation and spoilage of exposed grain
Producing
Processing & Packaging
Transporting
Storing
Retailing
Consuming
Disposing & Re-using
High rainfall and flooding
Increased risk of supply variability and delay e.g. reduced access to flooded areas
Heatwaves and hot extremes
Reduced shelf-life of food stored at room temperature leading to greater levels of waste
Met Office
Falloon et al., 2022

These projects demonstrate just a few examples of the ways in which the Met Office delivers science on food and farming to our stakeholders. We have been sharing more on the topic of climate and change and food security on our social media channels this month, so if you'd like to find out more follow #GetClimateReady on Twitter.

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September 2022